rate their broker-dealer on block transactions occurring in different time periods. The results of this study indicate that when conducting such an analysis, the intertemporal behavior of the block dealer costs should be considered.

Governmental Agencies

Market observors charged with guiding changes in the securities industry should contemplate the time dimension when they gauge security dealer costs because the results of this study indicate that the expected dealer costs change over time. As the National Market System evolves, the SEC should observe the intertemporal variation of block dealer costs to determine the effects of their policy changes.

Future Research

Cross-sectional studies on dealer costs must be particularly careful in matching the data according to time. Studies which compare dealer costs on transactions occurring in distinctly different time periods may distort their findings.

Faculty Working Papers

THE MONETARY RETURNS TO HIGHER EDUCATION: ARE THEY WORTH THE INVESTMENT COSTS?

Walter W. McMahon, Professor of Economics
and Education, Department of Economics
Alan P. Wagner, Purdue University

#619

College of Commerce and Business Administration
University of Illinois at Urbana-Champaign

industry should contemplate

dealer costs because the re

expected dealer costs chang

evolves, the SEC should obs

dealer costs to determine

Future Research

Cross-sectional studies

FACULTY WORKING PAPERS

College of Commerce and Business Administration

University of Illinois at Urbana-Champaign

October 18, 1979

THE MONETARY RETURNS TO HIGHER EDUCATION: ARE THEY WORTH THE INVESTMENT COSTS?

Walter W. McMahon, Professor of Economics
and Education, Department of Economics
Alan P. Wagner, Purdue University

#619

Summary:

This paper considers whether or not the costs of higher education over time, and differences in costs among occupational fields, are warranted by the differences in prospective monetary returns to the student and the society. It finds new evidence in microeconomic data of differences in rates of return among institutions, controlling for degree level and for student ability, and of persistent differences in rates of return among fields that offer opportunities for increased efficiency. Supplemental non-monetary returns and some social benefits of education are not included. But evidence is reported suggesting that real starting salaries for college graduates have stabilized in the 1976-79 period and that average long run rates of return to higher education have remained high and stable in relation to the returns available on alternative forms of investment.

Draft 10/1/79
Not for quotation
Comments welcome.

The Monetary Returns to Higher Education: Are They Worth the Costs?

Walter W. McMahon and Alan P. Wagner*

Are the monetary returns to higher education worth the investment cost?

To put the question this way is to put it very conservatively, for the total returns to education include non-monetary private returns (such as the contributions to efficiency in consumption, to asset management, to health, and to the education and health of one's children), plus external benefits to the society, and significant contributions of education to intergenerational equity. Since, however, the weight of the evidence in the preceeding chapter suggests that these non-monetary returns are positive, then if the monetary rates of return alone are as high or higher than can be obtained on the average on alternative investments, the total return to education is definitely worth the investment-cost.

But there are all kinds of education. Some kinds have higher rates of return than others, just as do some kinds of physical and financial assets, and all these rates vary somewhat over time. To address the question of whether or not education is worth the cost, it is relative rates of return that matter. Therefore, this paper will focus on 1) first, whether or not the monetary rates of return to higher education in the U.S. over time are or are not falling in relation to earlier years and in relation to the returns available from alternative investments, 2) second, whether rates of return at higher cost types of public and private institutions are as high or higher as those available through attendence at lower cost institutions, and 3) finally, in which major

fields or occupations the rates of return are highest in relation to alternative choices of fields.

Our system of higher education is based fairly heavily on the choices made by students and their families with respect to whether they should invest in education through choosing to attend college in relation to the alternatives, whether to choose a public or private institution of any given type, and what major occupational field to select. It is the expected private monetary rates of return that offer criteria relevant to which of these private decisions are most worth the investment-cost. The monetary rates studied in this paper do not include the non-monetary private benefits mentioned above, however, and hence are likely to understate total returns. Furthermore, there are social benefits that are relevant to educational policy that is implemented as budget decisions are made within institutions and by state and Federal educational policy makers. To partially accommodate the latter, some social rates of return (which reflect the full social costs and some of the social benefits) will also be discussed.

Part of the data for addressing these issues is from the College Placement Council (for starting salaries) and from the Current Population Reports, but most is from a nationwide survey containing 2,765 usable responses from students and their families collected by the authors with the help of the National Institute of Education and the American College Testing Program. This latter, when weighted to be representative of the national student population, has the strong advantage of microeconomic data in that the costs for each student are extremely specific (including, for example, not just the formal tuition costs,

but tuition net of scholarship aid to the specific student). This--as well as specific expected earnings and other earnings data--facilitates a calculation of a pure internal rate of return that is specific to each student. The resulting microeconomic rates of return permit controls for ability, and also facilitate comparisons of private and social rates of return among types of institutions as well as among occupational fields chosen.

The usual cross section, and the more unusual expected rates of return reported in this paper are useful in analyzing the influences of expected returns and costs on the investment behavior of families in the past. But to go beyond this and use them as criteria for analyzing the potential profitability of new decisions in the future requires the additional assumption, which we have explored, that the real earnings expected by students in the future are reasonably accurate guides as to what those earnings will actually be. The cohort studied could have finished bachelors degrees in 1976 and Ph.D.'s in 1980, and without some capacity to predict, there is no way of telling what their earnings will be, say, 25 years hence without waiting 25 years to see. Richard Freeman (1976), has predicted a permanent decline beginning in the 1970s in the returns to college graduates. Questions are raised about this below based on 1) the more recent evidence showing an absolute and a relative recovery in the job markets for college graduates in 1976-9, and 2) the mounting evidence that returns at the overtaking age 7-8 years after graduation should be used, allowing each new cohort to be better assimilated into the labor force. If these points are accepted, the result

is an overcrowded new entrant rather than the "Overeducated American" mostly because of the passing demographic wave and the 1974-5 and 1979-80 recessions. The implication of this result is that rates of return based on the long run age-earnings profiles are much more relevant to this type of investment decision than are rates of return that heavily reflect transitory dips in starting salaries. With respect to the expected rates of return, we have studied the starting salaries by occupation of white males in W. McMahon and A. Wagner (1979), and of females in M. Ferber and W. McMahon (1979), and found these expectations to be reasonably accurate both in terms of job market trends and in terms of the relative peaking of age-earnings profiles.

I. Monetary Rates of Return Over Time

It is appropriate that we start with a brief summary of the method of calculating private and social rates of return to investment in higher education. This will be useful when interpreting the new rates of return over time being found by others such as Smith-Welch (1978) and Joseph Liberman (1979) below as well as for interpreting the monetary rates of return calculated for each family in our microeconomic data.

Rate of Return Concepts and Method

The monetary rate of return is merely a type of cost-benefit comparison. It can be visualized in Figure 1 as that internal rate of return that discounts the stream of net monetary benefits attributable to higher education (Area A) back to its present value and sets it equal to the stream of discounted investment-costs (Areas T + D). This would

be a private rate of return, with the costs limited to the private tuition and foregone earnings costs net of term-time earnings borne by the student and his family and the benefits limited to those private returns received after taxes.[1] The social rate of return can also be visualized in Figure 1 by letting area A represent pre-tax earnings including the value of output contributed to the society through taxes paid, and by letting costs include the full costs to society. Full costs would include the tuition-subsidies received from tax funds, endowment funds, and other financial aids (Area S), as well as private costs. This should not imply that the incremental taxes paid by college graduates are a fully adequate measure of the external benefits of education, or of education's overall contribution to equity, but they are the best measures of the estimate by society of the value of these social contributions that are currently available.

The non-monetary private returns discussed by Robert Michael are also illustrated in Figure 1, consisting of 1) those accruing later to the student and his family following the investment made during the college years (Area B) and 2) the current consumption benefits enjoyed while attending college (Area C). Area B includes non-monetary job satisfactions, greater consumption-efficiency during leisure time hours, satisfactions during retirement, and the benefits of a longer life ($L_2 > L_1$) since more education of the individual and spouse are both known to contribute to better health and longer life.

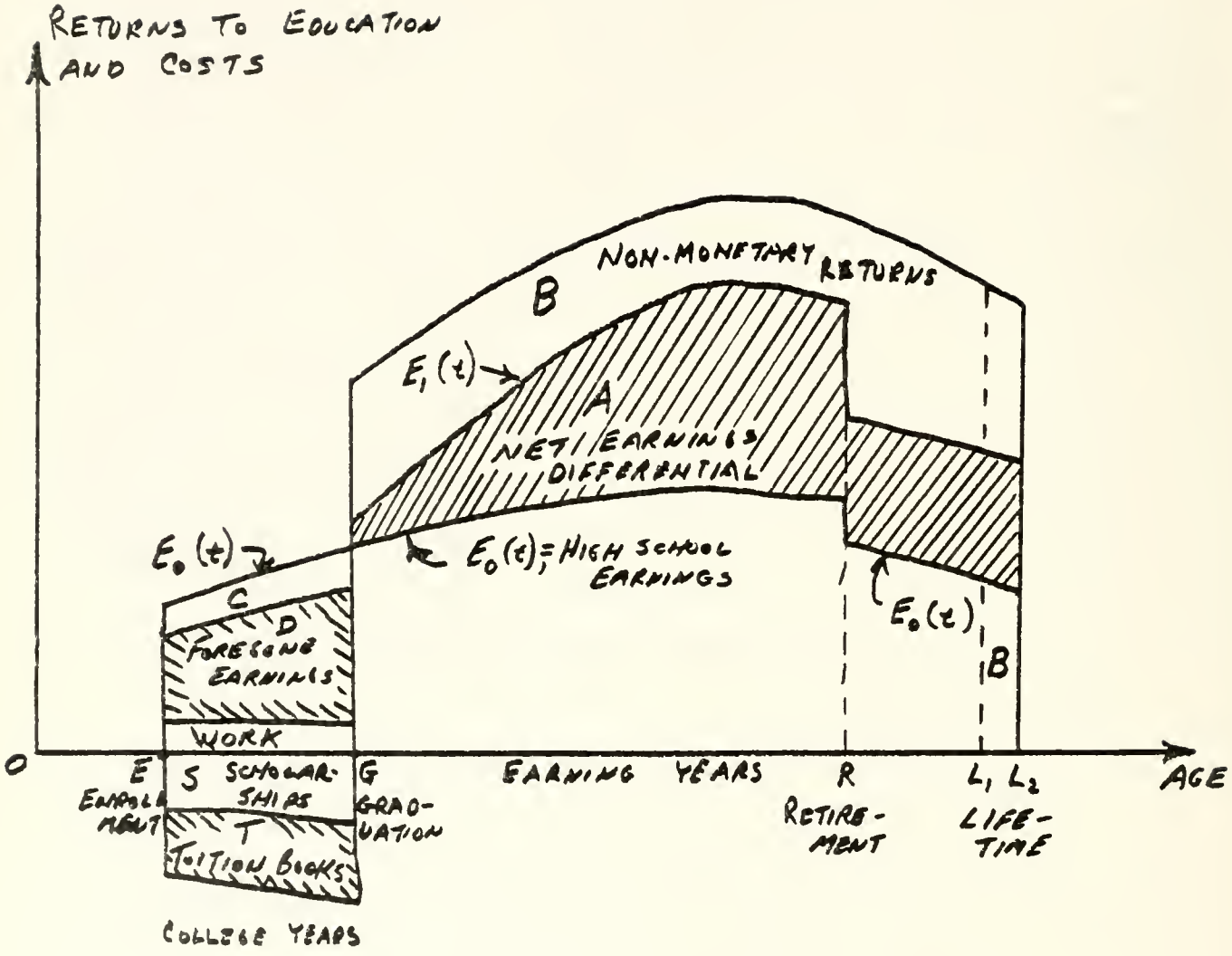


Figure 1. Investment in Higher Education and Private Returns Over the Life Cycle

Specifically, the monetary rate of return is calculated as that internal rate of return, r*, that equates investment costs (on the left) to benefits in the form of the net earnings differentials (on the right):

$$(1) \qquad \sum_{t=1}^{G-E} I_t(1 + r^*)^t = \sum_{t=1}^{R-G} Y_t/(1 + r^*)^t$$

where: Y_t = the annual net earnings differential attributable to higher education, $E_1(t) - E_0(t)$ in Figure 1,

I_t = annual investment costs consisting of tuition and fees, books, and foregone earnings, and

r^* = the private rate of return when Y_t is reduced by a 20% marginal rate for taxes on incremental earnings and I_t is net of earnings from part-time work (which does not represent study-time invested) and net of scholarships and other financial aids.

r^* = the social rate when earnings, Y_t, are measured <u>before</u> taxes and investment costs, I_t, are net of part time earnings but do include total tax, endowment fund, and other eleemosynary institution subsidies.

These rates of return, r*, are computed primarily in two ways in the new results reported below. The computation by Joseph Liberman of rates of return over time uses estimates of earnings functions by regression methods for population subgroups based on Consumer Population Reports Census data. The McMahon/Wagner computations are a pure internal rate of return solving Eq. (1) iteratively for each of the 2765 student-respondents in the sample by use of a computer algorithm explained in more detail in Appendix A of this chapter. These latter rates are computed to apply as of the date of graduation with investment costs compounded forward at rate r* to point G in Figure 1 so that students at different stages in their degree program can be grouped by degree objective and compared. These rates are also calculated to apply to the entire post-secondary degree program (e.g., BA 4 years, MA 5 years, etc.), rather than to the marginal year or degree, on the assumption that most

students contemplate the entire occupation-oriented degree program at one time.

Are Rates of Return Declining?

A final definitive answer as to whether the decline in the economic rewards to a college education in the 1970s is temporary or permanent must await the end of the 1979-80 recession and the passing into the labor force of the large population cohort born in the period surrounding 1957. But in the meantime considerable evidence has accumulated, and a tentative answer is available.

The issue has been raised primarily by Richard Freeman (1975, 1976, 1979) who has taken the position in the Overeducated American that the decline in the relative earnings of those with a college education in the 1970s is likely to persist for many years to come. He estimates that average social rates of return for all persons completing a bachelor's degree has fallen from the 11-14% range characteristic of 1950, 1960 and 1970 to 7.5-9.5% in the 70s, presumably to persist into the 1980s.

The basic question to be asked is, "Are Freeman's short-run rates of return that are based on adjusting all points on the age-earnings profile by the percent change in starting salaries relevant to this type of an investment decision, or are the longer run rates of return after each cohort is assimilated into the labor force the more relevant?" We take the position that it is the latter. Evidence is presented below to this effect, followed by evidence indicating that these longer run rates of return have not fallen. The longer run rates of return relative to the rates of return obtainable on alternative investments are the test of whether the monetary returns to college education alone continue to be worth the investment-cost.

Starting Salaries

Starting salaries are important in Richard Freeman's (1976, Appendix B) three equation recursive model that he uses to predict the continuing oversupply of college trained manpower. This is because it is the current starting salaries of college graduates relative to that accruing to high school graduates (CSAL-ASAL) that is the behavioral component in his first equation relating to the decision of potential freshmen to enroll. James P. Smith and Finis Welch (1978, pp. 12) raise a question about the statistical role of the (CSAL-ASAL) variable, suggesting that if it were deleted, the size of the 18-19 year old population alone would offer nearly as good a statistical explanation of freshman enrollment (R^2 = .970 as opposed to .987). They also suggest on logical grounds that "This kind of model is the antithesis of the full-career view ... where high entry wages signal low subsequent wages."[2]

Our studies of the expectations of students about earnings after graduation (see McMahon and Wagner, 1979) suggest that students may not be as myopic in their behavior as R. Freeman's (CSAL-ASAL) variable suggests. They have expectations of earnings twenty five years after completion of their degree program that are quite realistic when compared to the shape of age-earnings profiles at different degree levels and for different occupational choices seen in the longer run patterns evident in the long run age-earnings profiles revealed in the 1970 Census data. To be sure, blacks and females especially are relatively optimistic, but this could be interpreted as reflecting a long run improvement in the job markets they face. J. Smith and F. Welch (1977, 1978) have argued that this is due to an improvement in the quality of education received by

blacks, and by R. Freeman (1976) that the relative improvement for both blacks and women have also been due to declining discrimination and changing sex roles.

For starting salaries, Richard Freeman uses the College Placement Council data shown in Figure 2 below which we have extended up through 1979 using the same source. This reveals a recovery or leveling out of the market for college graduates since 1975 following the recession. There have been large increases in starting salaries expressed in current dollars in all fields shown, but when adjusted for the extraordinary inflation rates in 1973-4 and in 1979, some occupational fields are not keeping up.

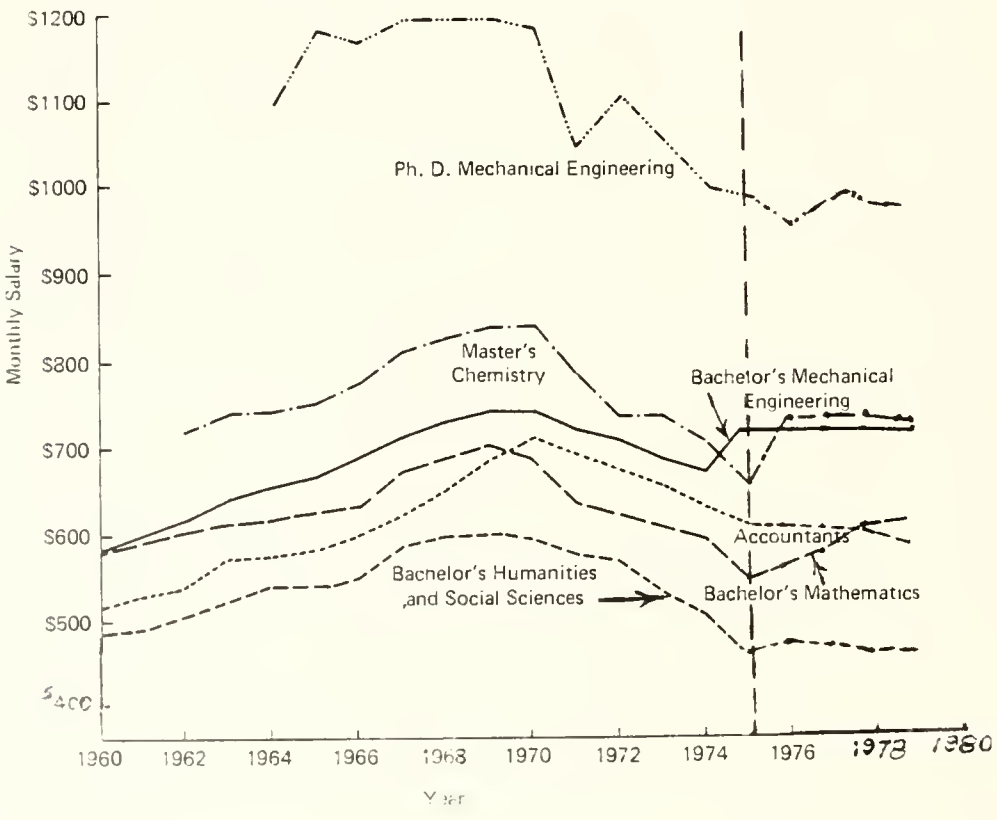


Figure 2. Real Starting Salary of College Graduates, 1960-1979
Source: 1960-1975 from Richard Freeman (1976, p. 11), 1976-1979 from College Placement Council (1979).
All are in 1967 dollars, deflated by the Consumer Price Index. For 1979, an 11.5% growth in prices is used, close to the Data Resources Inc. estimate.

Although the 1971, 1975 and 1979 recessions coincided with the entry into the job market of the largest and most educated population cohort in the U.S. history, there was a stabilization of the starting salaries following 1975 at the level characteristic of the 1960-1967 period, and no permanent trend in the average real starting salaries of college graduates is evident.

Ratio of Mean Income of College to High School Graduates

While absorbing this wave of new entrants during the 1970s, the relative earnings of college graduates aged 25-34 did decline as can be seen from 1969 to 1974 in Table 1. But note the stabilization and partial recovery from 1975 through 1977. This is indicative of some recession-induced and inflation-induced effects on new entrants. The stagflation of 1979-80 makes it harder to absorb the tail end of the large wave of new entrants, and is likely to have effects similar to those shown in the inflation-recession of 1974-1975.

Table 1

Ratio of Mean Income of College to High School Graduates

All Workers	Year										
Ages	67	68	69	70	71	72	73	74	75	76	77
25-34	1.33	1.32	1.33	1.33	1.27	1.22	1.19	1.15	1.19	1.26	1.21
35-44	1.53	1.47	1.58	1.54	1.55	1.55	1.52	1.55	1.56	1.55	1.48

Source: Various issues of Current Population Reports, Series P-60, as reported in Smith-Welch (1978, p. 6), extended to 1977-78.

This data show that there has not yet been a trend-type decline since 1968 in the relative market value of a college education for those aged 35-44, the age range that most reflects the greater peaking of the college-level age-earnings profiles. The huge wave of new entrants in the 1971-79 period affecting the 25-34 aged group therefore has not yet affected the premium paid to college graduates in older age groups, and there is hope that before it does so, the wave can be assimilated.

Rates of Return Calculated at the Overtaking Age

All of this suggests that estimates of returns to college and of rates of return for lifetime investments of this type should not be based exclusively on starting salaries, but should instead be based on returns at the overtaking age and/or later points in the age-earnings profile. This comes closer to a more stable long run rate of return after a bulge of new entrants has been more adequately assimilated.

An interesting new study by Joseph Liberman (1979) allows for this assimilation and for net post-schooling investment by calculating rates of return using earnings functions at the overtaking age. The concept of the "overtaking age", as originally introduced by Jacob Mincer (1974, p. 109), suggests that post-school investment related to job search and learning through experience on the job keep the individual's observed wage below the wage predicted from his schooling for 7-9 years. As the return from post-school investments in human capital grow, the actual observed wage grows as well, and finally overtakes and exceeds the schooling-predicted wage. For the college graduate, this schooling-predicted wage could be read off his or her earnings profile at age 29, the eighth year after graduation.

To estimate marginal rates of return at the overtaking age, Liberman fits Jacob Mincer's "expanded schooling model" with cross section Current Population Reports data for males. As shown in the footnote to Table 2, this model contains not only schooling (S) and years of work experience (t and t^2) terms, but also a squared schooling term (S^2) and an interactive schooling-times-work experience term. Joseph Liberman's cross section regression results using this model for each year from 1958 through 1976 fit the data quite well, with all R^2 greater than .96 and all regression coefficients significantly different from zero. The marginal rates of return for elementary school, high school and college then are estimated by obtaining the derivative of the regression equation (one for each year) with respect to S as shown at the top of Table 2, and substituting in for S at the 8, 12, and 16 year levels of interest while holding t constant at the overtaking age of 8 years.

The portion of Joseph Liberman's more extensive and interesting results which are relevant to the question raised in this chapter are shown in Table 2, which he has very kindly given us permission to reproduce.

The results are probably most comparable to a social rate of return, since pre-tax income is used in the regressions, although some inaccuracy is introduced by the inclusion of property income and the lack of specific investment cost data. The interesting point for our purposes is that there is no evidence that the rate of return to a college education for males when estimated at the overtaking age has declined. The estimates in Table 2 suggest it has remained quite stable between 13.3% and 15.2% throughout the 60s and 70s, and may in fact have risen somewhat in 1975 and 1976.

TABLE 2 — Estimates of the marginal rates of return at different years of schooling derived from the derivative of the Expanded Model * regression results at eight years of experience:

$$r_m = \frac{d \ln Y_t}{ds} = \hat{b}_1 + 2\hat{b}_2 S + 8\hat{b}_3$$

Year	Elementary School (Eight Years) (1)	High School (Twelve Years) (2)	College (Sixteen Years) (3)
1958	.1104	.1264	.1424
1961	.1102	.1262	.1422
1963	.1069	.1205	.1341
1964	.1075	.1203	.1331
1966	.0981	.1165	.1349
1967	.0994	.1186	.1378
1968	.0892	.1156	.142
1969	.0998	.1206	.1414
1970	.0973	.1205	.1437
1971	.1006	.1254	.1502
1972	.0939	.1195	.1451
1973	.1029	.1205	.1381
1974	.1070	.1230	.1390
1975	.1023	.1255	.1487
1976	.0976	.1248	.1520

Year of Schooling	Mean	Standard Deviation	Coefficient of Variation
Elementary School	.1015	.0061	.0601
High School	.1216	.0035	.0288
College	.1416	.0057	.0403

* $\ln Y_t = \hat{a} + \hat{b}_1 s + \hat{b}_2 s^2 + \hat{b}_3 st + \hat{b}_4 t + \hat{b}_5 t^2 + \hat{u}$

Microeconomic Internal Rates of Return

The results reported above can be compared to the microeconomic internal rates of return computed for each student in our national sample. Those rates reflect very specific cost data, as mentioned above, for students graduating in 1976. The sample was weighted to be representative of the entire population of U.S. students, as shown in Appendix B. For comparison to the results obtained by Joseph Liberman, we have computed the "realized" social rate of return for students in our national sample using 1970 Census data on earnings at each age for persons of the same sex, race, and occupational choice. As shown in Column 3, the 13.3% for white males compares to the 14.3% obtained by Joseph Liberman for 1970. Earlier cohorts of blacks did less well. This 13.3% for white males is right in the middle of the 12-14% range for 1970 obtained by Richard Freeman, as indicated above.

The expected rate of return in Column 1 of Table 3 reflects the real earnings students expect to receive twenty-five years later as the benchmark used to estimate their entire expected age-earnings profile (see Appendix A). These expected rates of return should be interpreted as applying to 1976 bachelors degree graduates. The 17.0% that we obtain includes the more optimistic expectations by blacks based on trends in the college-educated labor market and compares to the 15.2% obtained by Joseph Liberman for 1976 in Table 2. It also may reflect some optimism noted by Freeman (1975, p. 291) by all students about their prospects.

Over Time, Are The Returns Worth the Cost?

We conclude that they are. Realized rates of return have remained in the 13.8-15.2% range throughout the 1970s when estimated either at

the overtaking age, or using the entire cross sectional age-earnings profile. Expected rates of return in 1976 were as high or higher. All

Table 3

Long Run Expected and Realized Social Rates of Return to BA Degree

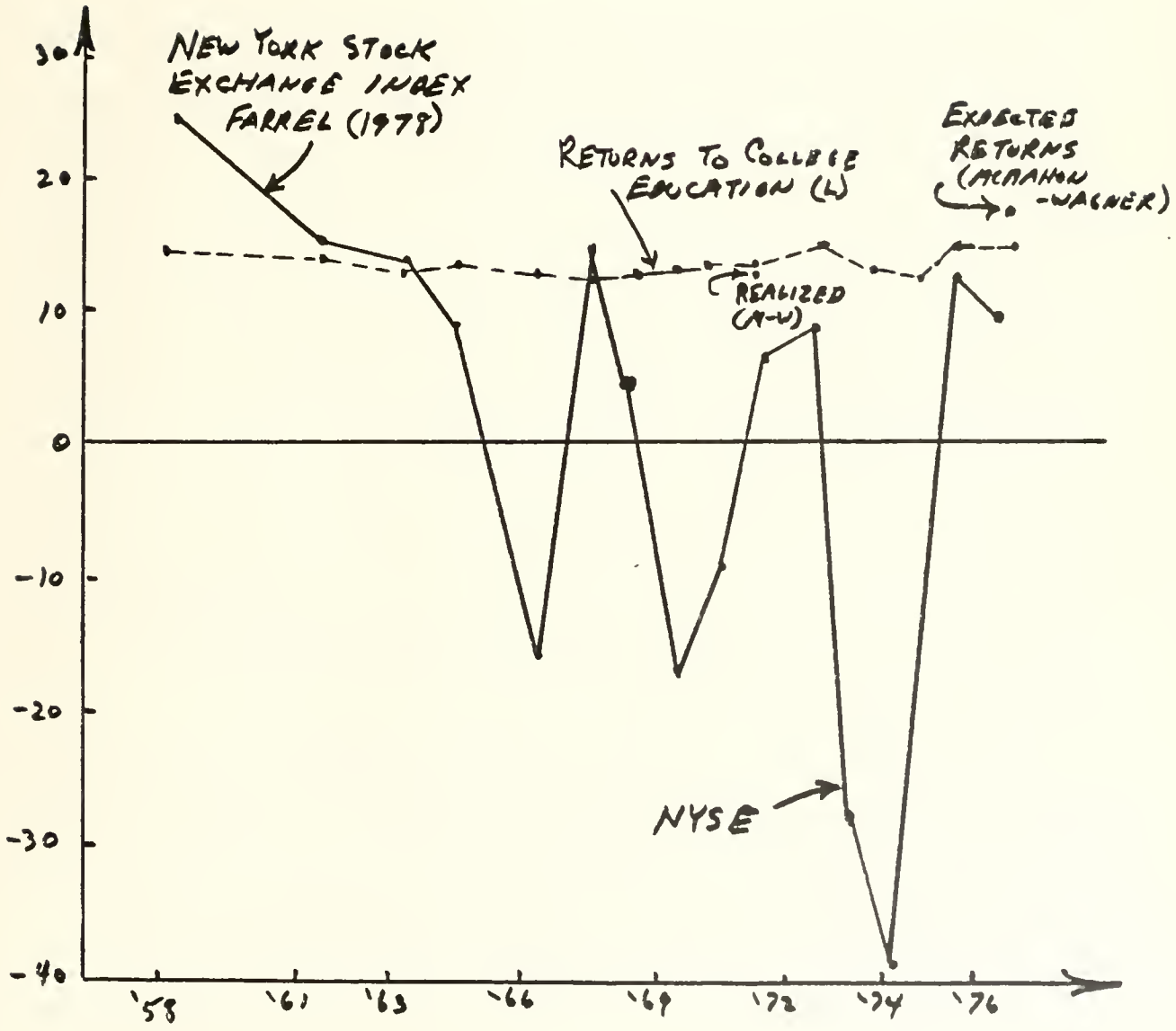
	Expected Rate of Return, 1976	Realized Rate of Return, 1970
All Males	17.0%	13.0%
White	17.0%	13.3%
Black	17.1%	8.3%

of these are relatively high when compared to the average rate of return on financial assets as measured by the New York Stock Exchange Composite Index, as can be seen in Figure 3. These longer run rates of return to a college education have also been stable, and as Joe Liberman says, "The risk is minimal."[3] A final answer will not be available in the data until several years after the entry of the large 1979 college population cohort into the labor market and after the 1979-80 recession ends. But the evidence that is currently available is very suggestive.

Finally, the consideration of monetary returns understates total returns to the extent that there are significant non-monetary returns such as those considered in the preceding chapter.

II. Monetary Rates of Return by Type of Institution

Higher education in the U.S. involves a diverse set of institutions, each providing a somewhat unique set of education programs at widely-different costs. An examination of rates of return across the broad



Long Run Rates of Return to College
and Rates of Return to Financial Assets

Figure 3

types of institutions which takes their cost differences and the differences in student earnings into account after controlling for ability provides interesting insights as to where the returns are most worth the cost.

Expected rates of return calculated for each respondent in our nationwide sample of 1976 college graduates reflect very specific individual tuition costs net of scholarships and also reflect their expected earnings. To ensure the accuracy of the financial data, respondents provided their estimates of financial aid funds received from eight possible sources and of gross tuition. Those who returned the original questionnaire with incomplete financial data received a one-page supplement requesting the information. The student expense and financial aid responses of these students appear to be quite reasonable in relation to the information available from published college catalogues, other student surveys, and financial aid program data (see McMahon and Wagner, 1973; Wagner and Tenison, 1976).

The salaries students expect to receive in each field, when checked against salary offers in those fields, were found to correspond reasonably closely by McMahon and Wagner (1979). This is true not only for starting salaries in each field, but also for the peaking of the age-earnings profile as indicated by salaries twenty five years hence. Since it appears that students estimate their longer run returns among occupations fairly accurately, and since breakdowns of earnings by type of institution which are not available in Census data also reflect differences in choice of occupational field objectives, it is reasonable to assume that students expected earnings will reflect many differences in actual earnings of graduates attributable to the type of institution attended.

The results reported here on costs, expected earnings, and rates of return all control for race and sex differences by focusing on white males (although the rates for blacks and females also were computed). In reporting rates of return by type of institution later in this section, we also have controlled for differences in ability by reporting results by ability quartiles using composite test scores on the ACT assessment.[4] This is an important control, although it does not control for all of the variation in this factor. This serves to partially eliminate entering ability as a factor, and to control for the selectivity (i.e., non-price rationing) of the more prestigious institutions, which would otherwise distort the results. The analysis thereby concentrates more closely on the differences in the costs and quality of the education added.

Cost Differences

The variation in costs, and returns, averaged within the Carnegie Commission's four-year institution type and control classes, is evident in Table 4.[5] All cost and return data have been re-expressed in 1979 dollars. "Private investment costs," referring to the costs actually incurred by the student and his family during the school year, are shown in the first row. Composed of tuition and fees, books and supplies, and net, after-tax earnings foregone (i.e., part-time earnings have been subtracted) less any grant and scholarship aid, the average annual costs faced by white males at private liberal arts colleges were the highest, at $4,642. Families with white male students at public research universities invested a smaller average of $4,115 for the academic year. Surprisingly, white males attending private research universities invested

Table 5

Annual Private and Social Investment Costs and Expected Earnings of White Males by Four-Year Institution Type and Control, in 1972 Dollars

(standard errors, computed as s/√n, are shown in parentheses below each mean)

Cost, Return Component	Institution Type and Control[a]				
	RESEARCH UNIVERSITIES		COMPREHENSIVE FOUR-YEAR COLLEGES		LIBERAL ARTS
	Public	Private	Public	Private	Private
	Mean Private Investment Costs				
TOTAL PRIVATE COSTS	$4,115 (160)	$3,506*	$4,117 (152)	$4,271 (189)	$4,642
Tuition	801 (15)	1,001*	925 (61)	1,061 (91)	1,565 (131)
Books and Supplies	287 (23)	234*	244 (12)	178 (6)	222 (20)
Foregone Earnings Gross, After Taxes	3,773	3,773	3,773	3,773	3,773
Net of Term-Time Earnings[b]	3,214 (113)	3,773*	3,140 (135)	3,147 (157)	3,140 (145)
Grants and Scholarships (-)	188 (76)	1,502*	198 (46)	115 (75)	284 (122)
	Mean Social Investment Costs				
TOTAL SOCIAL COSTS	$7,444 (175)	$8,027*	$6,670 (156)	$5,999 (303)	$6,498 (140)
Instructional Costs per FTE	3,000 (120)	3,077*	2,333 (71)	1,730 (97)	2,210 (90)
Books and Supplies	287 (23)	234*	244 (12)	178 (6)	222 (20)
Foregone Earnings Gross, Before Taxes	4,716	4,716	4,716	4,716	4,716
Net of Term-Time Earnings[b]	4,157	4,716*	4,083	4,090	4,083
	Mean Expected Salary				
EXPECTED MONETARY RETURNS					
Starting	$17,716 (777)	$20,025*	$17,119 (907)	$16,843 (485)	$15,556 (329)
In 25 Years	26,518 (1,958)	33,375*	29,209 (1,657)	32,905 (1,440)	22,688 (938)

*Less than 6 respondents in cell.

[a]Institutional Groups by Carnegie Commission classification

[b]"Net of Term Time Earnings" calculated as gross earnings, over 40 weeks, less earnings from part-time job during school year.

SOURCE OF DATA: ACT College Investment Decision study sample of 2,765 students, contacted in early 1972, who could have completed BA's in 1976.

the least ($3,506), due to larger scholarships and tuition waivers, but the sample in this cell is small. The private costs at private liberal arts colleges are the highest. White males attending comprehensive colleges, whether public or private, and those attending public research universities incurred very similar middle-range investment costs of $4,115 to $4,271, however.

Social costs, which include the full costs of instruction, reveal a different picture. Looking across the middle row of Table 4, they are highest at private research universities ($8,027, although the sample in this cell is small) and next highest at the public research universities ($7,444). These figures reveal a pattern similar to Bowen's "educational expenditure per student unit" (Table 2, Chapter 7), where he also finds that instructional costs are highest at research universities and lowest at comprehensive colleges.[6] The research institutions have larger instructional cost per average student FTE than do other institutions as might be expected, but the full instructional costs at private and public research institutions are remarkably similar at about $3,000 per student. Social costs at liberal arts colleges and at four year comprehensive colleges are lowest ($6-6,700) and remarkably similar.

The higher private costs at the liberal arts colleges and the higher social costs at the private and public research universities can be justified, however, if there are also differences in the returns that follow this pattern.

Expected Earnings

As the last two rows in Table 4 reveal, those attending the larger private research institutions expect to earn several thousand dollars

more upon completion of a BA and those attending the public research institutions expect to earn $1-2,000 more than those attending private liberal arts colleges or private comprehensive four year institutions. The low expected earnings for those in liberal arts colleges may be misleading, however, since those with a terminal bachelors degree objective shown in this Table may not be typical. So it will be interesting to see in a rate of return calculation that also shows those planning advanced degrees and includes a control for ability whether or not the larger expected returns are worth the larger costs.

Earnings expected in 25 years by white males attending research universities, both public and private, on the average are also significantly larger. This may reflect the effect of faculties who are actively contributing to new knowledge, better libraries, computers, and lab facilities, as well as screening and credentialling. The social costs are lower in the four year comprehensive public and private colleges, but the returns are also lower. A rate of return calculation can best reveal whether investment at the lower or at the higher cost institutions is more advantageous.

Private Rates of Return

Table 5 is more significant than what has gone before because it combines investment-cost differences, earnings differences, and differences in the growth of earnings over the life cycle in one summary statistic, a long run internal rate of return. A control for differences in the student ability mix among institutions, and hence to some extent for equity considerations consistent with the first and lowest level humane growth criterion suggested in Chapter 1, can be imposed by

[illegible] (Standard errors, computed as s/√n, are shown below each rate)

Ability Quartile[a] and Degree Level	Institution Type and Control[b]				
	PROGRAM UNIVERSITIES		COMPREHENSIVE FOUR-YEAR COLLEGES		LIBERAL ARTS
	Public	Private	Public	Private	Private
	Mean Private Rate of Return				
All Ability Quartiles					
Bachelor's	19.0 (1.2)	26.0*	21.0 (1.8)	18.5 (2.0)	8.7 (2.4)
Master's	9.6 (1.4)	17.3* (2.4)	6.2 (1.3)	-.7 (2.4)	7.7 (.6)
Doctor's/Professional	19.3 (4.1)	11.6 (.2)	9.0 (1.0)	-1.8 (4.1)	10.3 (1.7)
Top Ability Quartile					
Bachelor's	15.4 (3.5)	26.0*	19.9 (1.3)		-8.9 (5.4)
Master's	8.7 (2.9)	23.0*	9.7 (2.0)		11.0* (1.8)
Doctor's/Professional	10.2 (1.6)	11.9 (.1)	11.4 (1.4)	-11.9 (5.2)	9.3 (2.0)
Second Ability Quartile					
Bachelor's	19.0 (1.9)		15.0 (2.2)	5.2 (4.0)	
Master's	8.6 (2.4)	14.5* (2.1)	3.9 (2.6)	6.1 (1.6)	8.1 (1.2)
Doctor's/Professional	10.6 (4.0)	8.0* (1.8)	6.8 (2.6)		
Third Ability Quartile					
Bachelor's	20.6 (1.7)		27.2 (3.8)	25.0 (2.3)	16.1 (1.1)
Master's	12.4 (.6)		7.4 (.7)	4.3 (3.6)	7.5 (.4)
Doctor's/Professional	38.4 (11.1)		1.3 (.3)		
	Mean Social Rate of Return				
All Ability Quartiles					
Bachelor's	15.1 (1.6)	18.0*	17.7 (1.6)	15.9 (1.7)	7.1 (2.3)
Master's	8.0 (1.4)	15.0* (2.4)	4.9 (1.5)	-1.4 (2.3)	6.9 (.4)
Doctor's/Professional	17.9 (4.1)	10.5 (.2)	9.3 (.8)	-5.0 (4.4)	10.1 (1.9)
Top Ability Quartile					
Bachelor's	12.1 (2.8)	18.0*	16.1 (1.7)		-11.4 (4.1)
Master's	6.9 (2.7)	21.0*	7.7 (3.0)	-9.0	9.1* (1.4)
Doctor's/Professional	8.9 (1.5)	10.8 (.1)	8.7 (.8)	-15.6 (5.2)	9.2 (1.8)

*Less than 6 respondents in cell.

[a]Ability quartiles established from the distribution of ACT composite test scores within the sample.

[b]Institutional groups by Carnegie Commission classification.

SOURCE OF DATA: ACT College Investment Decision study sample of 2,[illegible] students, conducted in early 1972 who could have completed [illegible] in 1971.

reading across the rows of the Table. The overall result is not a simple statement that rates of return are high at some types of institutions and low at others, but that where the highest rates of return are found depends upon the student's ability and degree-level or occupational field objective.

Private rates of return for white males irrespective of ability level or degree objective are almost always several percentage points higher at public institutions and at private research universities (although the latter cells are small) than at private four year institutions and liberal arts colleges. Considering only the top ability quartile and students with advanced degree objectives however, the liberal arts colleges do very well with expected rates of return in the 9-11% range very similar to the 9-11% rates for comparable students at public four-year and public research universities. The higher private rates of return at private research universities undoubtably reflect the large tuition waivers received by the few students in these cells, all of whom were in the top two ability quartiles. The large expansion of economic opportunity grants since the Education Amendments of 1972 and 1980 will serve to further increase private rates of return by reducing private investment costs, especially at private four year institutions and liberal arts colleges, which would operate to offset the modest comparative advantage shown by the private rates in the public sector.[7]

A second finding emerges from Table 5. At the BA level, private rates of return tend to be highest at comprehensive colleges, while, at the doctor's/professional degree level, the highest rates are exhibited at research universities. Consider, for example, white males planning to complete only a BA who largely come from the third ability quartile. Within this lower ability group, the private rates of return are relatively high at 25 percent, but only at comprehensive four year colleges. Students expecting advanced degrees, and who are in the top ability quartile, anticipate private rates of return in the 10.2 to 11.9 percent range if they are completing their undergraduate program of study at research institions, or public four year institutions, but not at private comprehensive colleges that may have more of a trade school orientation.

Finally, students attending liberal arts colleges expect to fare somewhat less well than their peers, as shown in most degree and ability groups in the last column of Table 5. This may reflect the heavier mix of scientific, social scientific and humanities fields chosen as compared to the more vocationally-oriented fields offered especially at the BA level at the four year comprehensives.[8]

Social Rates of Return

The expected social rates of return are shown in the bottom half of Table 5. These rates reflect the measurable part of the payoff to society from the investment, and thus require measures of full social costs including the costs of public and private tuition subsidies at each institution as well as the full returns before taxes.

Perhaps the most significant finding is that the social rates of return tend to be highest for students seeking masters, Ph.D, and professional degrees who also choose public or private research universities or liberal arts colleges for their undergraduate work. This is a pattern that emerged among the private rates, and therefore suggests that the public subsidies that affect the private rates do not distort private investment decisions.

For those seeking terminal bachelor's degrees, the social rates of return are highest at the comprehensive four year colleges (and at the private research universities, but there the sample is small). This pattern also is similar to that found for the private rates.

Therefore, the lower costs at the comprehensive four year colleges do show up in higher social rates of return <u>at the BA level</u>, whereas the higher costs at the research universities and liberal arts colleges seem to be warranted by the returns expected by those whose objective is an advanced degree who choose these schools.

Overall this evidence suggests that the private institutions are not at so great a competitive disadvantage with public institutions as the differences in tuitions would imply. This is especially true at private research universities when private costs are lowered through tuition waivers and grants. But even without sizable grant aid, the comprehensive four year colleges have a competitive advantage at the bachelors level (although the private comprehensives are quite inefficient in serving students who have advanced degree objectives). The private liberal arts colleges are both privately and socially competitive

in serving students who anticipate graduate study. The higher costs at the research institutions are covered by higher expected earnings, perhaps because of the effects of institutional quality, credentialling, and specialized fields of study.

III. Monetary Rates of Return by Intended Occupation

Each year, college students also choose fields of study leading toward particular occupational goals. To consider expected earnings, as we have done in a recent paper (see McMahon-Wagner, 1979), is not enough. An examination of rates of return by degree level and by intended occupation that takes into account foregone earnings and direct cost differences can provide additional insight into which fields have monetary returns that are most worth the cost.

Expected Earnings by Occupational Field

Census data reveal substantial differences in earnings of college graduates by occupation, a pattern also evident in the salaries anticipated by the college students we contacted. Each respondent provided point estimates of the annual earnings he or she expected at graduation and in twenty-five years. To facilitate comparisons with other studies, even though the improved earnings by black and female graduates is a factor, we continue to examine here only the data provided by white males. Table 6 contains their responses to the salary questions, grouped by broad, occupational categories and selected occupations within these categories.

Note, in particular, the variation among occupational fields in average expected salaries, for each degree level, as is shown by looking down the columns in Table 6. At the bachelor's level, white male freshmen as

health technicians expected about $12,969 (in 1979 dollars) to start, while their peers in engineering anticipated an initial salary of $18,252. In twenty-five years, the expected salaries for bachelor's candidates continued to vary widely in the same direction from about $20,000 for those planning to be clergymen to $34,355 in engineering-technical careers. At the most advanced degree levels, white males looking toward jobs in the health professions anticipated receiving $30,764 to start, whereas their peers opting for engineering-technical fields expected a smaller $18,618 starting salary. The health professions were not only high to start, but are expected to maintain this advantage 25 years later as shown by the $59,464 salaries expected by doctors, and the $37,584 salaries expected by engineers.

Private Rates of Return

Separate occupation-specific rates are most justifiable for those occupations that require a significant and specialized human capital investment acquired through formal education and to some extent through experience (e.g., Doctors, Lawyers, Engineers, Architects). In these occupations, once a significant portion of the investment is made, it is costly to switch later--a kind of putty-clay effect in human capital investment processes. For some other occupations, inter-occupational mobility may be easier and a means of raising the returns realized on earlier investment (e.g., liberal arts graduates who are selected as managers on-the-job). In the case of these occupations, the calculated rate of return to education per se is likely to be distorted. But with the two qualifications in mind that for occupations where specialized education is less important, and that non-monetary returns to education

[illegible]

(standard errors, [illegible])

Occupation	Associate		Bachelor's		Master's		Doctor's, Professional	
	Expected Starting Salary	Expected Salary in 25 Years	Expected Starting Salary	Expected Salary in 25 Years	Expected Starting Salary	Expected Salary in 25 Years	Expected Starting Salary	Expected Salary in 25 Years
Health			17,036 (988)	29,[illegible] (1,[illegible])			30,764 (2,153)	58,708 (3,736)
Doctor, Dentist							32,535 (2,348)	59,464 (4,137)
Health Technician			12,969 (1,348)	20,470 (1,243)				
Pharmacist			19,729 (918)	30,237 (2,181)			18,239 (1,322)	54,331 (7,769)
Lawyer							24,475 (724)	64,266 (2,927)
Engineering - Technical	14,998 (1,063)	27,702 (1,598)	19,914 (636)	34,255 (1,284)	17,359 (833)	35,870 (2,319)	18,615 (1,121)	41,692 (4,901)
Architect			22,929 (1,173)	29,344 (1,108)	19,632 (2,134)	46,692 (6,513)		
Engineer			18,252 (764)	36,209 (2,436)	18,618 (766)	38,053 (2,576)	20,268 (479)	37,564 (2,415)
Elec. Technician	16,171 (627)	29,202 (945)	18,272 (375)	30,519 (1,058)				
Business	12,038 (324)	27,045 (1,075)	17,119 (416)	31,104 (1,201)	17,723 (676)	35,994 (2,044)		
Accountant	12,026 (345)	25,831 (818)	17,960 (674)	32,852 (1,682)	17,980 (1,061)	39,004 (3,586)		
Manufacturing Mgr.			15,319 (793)	27,535 (2,413)	17,828 (1,004)	35,119 (2,616)		
Sales, Retailing			16,734 (382)	30,220 (2,261)				
Other Professional			14,870 (369)	27,155 (1,191)	18,095 (822)	32,997 (1,085)	17,493 (1,357)	36,079 (3,239)
Clergyman			13,757 (102)	20,024 (824)				
Natural Scientist					19,981 (1,715)	32,273 (2,495)	15,479 (2,693)	33,382 (6,204)
Social Scientist							22,209 (3,482)	32,808 (6,343)
Education			15,551 (641)	27,739 (1,834)	16,168 (526)	29,232 (1,577)	15,032 (849)	59,037 (10,029)
Elem. & Sec. Teacher			15,569 (641)	27,750 (1,834)	15,612 (414)	26,067 (1,203)	14,124 (829)	70,471 (13,995)
College Professor							17,034 (1,354)	33,814 (4,288)

SOURCE OF DATA: ACT College Investment Decision Study sample of 2,766 students, contacted in early 1972, who could have completed BA's in 1976.

and social benefit externalities must still be added, this rate of return test of which kinds of education at least equal the rate of return to financial assets and hence are socially profitable can be applied.

The expected private rates of return calculated for each white male respondent are averaged within occupational groups in Table 7, with those revealing the highest average rates of return for the broad groupings of fields appearing at the top of the table and groups with lower rates toward the bottom.

First, wide differences in the implicitly expected rates of return to college investment by occupational fields for white males exist. As shown in Table 7, the rates are highest in health, law, and engineering-technical fields, and lowest in the clergy, natural scientist, social scientist, and education fields. Aspiring architects and engineers exhibit expected private rates of return greater than twenty-five percent at the bachelor's level, while the rate for clergymen measures an estimated -1.6%. For future doctors, dentists, and lawyers, the private rates fall in the 12.8 to 16.4 percent range, the highest among advanced degree seekers. In contrast, the expected private rates of return to other professional and education fields at the doctor's/professional degree level ranges from -1.6 to 5.4 percent. Many of the latter students will confront a market in which there are few opportunities other than academic employment, while at the same time Federal support for research is not growing as it was in the 1960's.

Second, the usual pattern of lower rates of return at the more advanced levels that has been so widely observed can be seen in Table 7 within every field. However, somewhat higher rates for professionally-oriented

Table 7

Expected Private Rates of Return of White Male Students by Intended Occupation and Degree Objective

(standard errors, computed as $s/\sqrt{n}$, are shown below each mean)

Occupation	Degree Objective			
	Associate	Bachelor's	Master's	Doctor's/ Professional
Health		19.1 (2.0)		12.8 (1.3)
Doctor, Dentist				14.0 (1.2)
Health Technician		11.6 (3.2)		
Pharmacist		23.3 (7.9)		4.4 (4.8)
Lawyer				16.4 (2.0)
Engineering - Technical	41.5 (7.5)	28.2 (2.2)	10.3 (.8	8.2 (.8
Architect		26.6 (2.4)	12.7 (1.7)	
Engineer		25.5 (2.9)	12.0 (1.1)	8.6 (.5)
Elec. Technician	48.2 (4.1)	45.9 (9.8)		
Business	26.7 (1.7)	22.4 (1.7)	11.9 (.9)	
Accountant	27.2 (1.8)	22.8 (1.7)	12.7 (1.5)	
Manufacturing Manager		28.0 (7.4)	11.9 (1.1)	
Sales, Retailing		17.9 (1.6)		
Other Professional		10.3 (1.7)	8.8 (1.0)	3.1 (1.5)
Clergyman				-1.6 (3.0)
Natural Scientist			8.9 (3.0)	4.5 (2.3)
Social Scientist				-.1 (4.0)
Education		12.3 (1.7)	1.6 (1.5)	3.9 (1.9)
Elem. & Sec. Teacher		12.3 (1.7)	.8 (1.6)	1.8 (2.7)
College Professor				6.4 (1.3)

SOURCE OF DATA: ACT College Investment Decision Study sample of 2,786 students, contacted in early 1972, who could have completed BA's in 1976.

Table 8

Expected and Realized Social Rates of Return of White Male Students by Intended Occupation and Degree Objective

(standard errors, computed as $s/\sqrt{n}$, are shown below each mean)

Occupation	Degree Objective				Average,[a] All Degree Level	
	Associate	Bachelor's	Master's	Doctor's/ Professional	Expected	Realized
Health		16.1 (1.5)		11.1 (1.0)	12.7	7.2
Doctor, Dentist				12.2 (.8)	12.2	11.7
Health Technician		9.1 (2.5)			9.4	-30.5
Pharmacist		20.1 (1.1)		3.9 (4.8)	15.2	12.4
Lawyer				15.5 (2.1)	15.5	14.1
Engineering - Technical	36.4 (8.0)	24.4 (2.2)	8.5 (.7)	7.2 (.8)	19.0	12.6
Architect		23.6 (2.3)	10.5 (1.6)		17.2	8.5
Engineer		18.9 (2.0)	10.0 (.6)	7.4 (.4)	14.1	11.0
Elec. Technician	41.3 (4.1)	43.8 (1.0)			40.8	24.6
Business	22.1 (1.4)	17.1 (.9)	10.4 (.7)		15.9	11.3
Accountant	23.0 (1.1)	17.8 (1.5)	10.7 (1.2)		17.3	9.0
Manufacturing Manager		16.0 (.8)	10.8 (.9)		13.2	15.2
Sales, Retailing		16.6 (1.1)			15.5	12.4
Other Professional		7.6 (1.6)	7.8 (1.0)	1.4 (1.6)	6.5	3.7
Artist & Musician					7.4	
Clergyman				-2.1 (3.6)	-2.8	-17.5
Natural Scientist			7.4 (3.0)	3.2 (3.1)	9.4	7.7
Social Scientist				-4.8 (4.5)	-4.1	8.0
Social/Welfare Worker					6.1	
Education		10.3 (1.6)	0.0 (1.6)	3.1 (2.0)	3.8	-2.3
Elem. & Sec. Teacher		10.3 (1.6)	-.8 (1.6)	2.0 (3.0)	3.3	-3.8
College Professor				5.2 (1.2)	7.8	5.5

[a]Averages include observations in cells that contain less than six respondents and are left blank.

SOURCE OF DATA: ACT College Investment Decision study sample of 2,765 students, contacted in early 1972, who could have completed BA's in 1976.

degrees can be seen at the doctoral level for elementary and secondary school teachers (where pay scales recognize advanced degrees), in medicine, and law. In the other cases, the rates fall with more advanced schooling due primarily to rising foregone earnings costs.

Third, the private rates of return are generally highest where expected earnings (shown in Table 6) are highest. For example, the quite high 28.2% average expected private rate of return among white males in engineering-technical fields at the bachelor's degree level reflects their relatively high estimated starting and future salaries of $19,914 and $34,355. Business students expecting to be manufacturing managers represent an exception, where the somewhat lower expected earnings combined with lower private investment costs (reduced further through part-time earnings, grant, and scholarship aid) produced a relatively high private rate of return of 28.0 percent.

Social Rates of Return

Although the private rates in Table 7 are better for the analysis of behavior, the social rates of return in Table 8 which reflect the full costs and full earnings are better for use as an input in the formation of social policy.

The most significant result is that the average expected social rates of return in Health, Law, Engineering, and Business fields shown in column 5 are all above the 10% rate of return on financial assets in 1976 (as measured by the New York Stock Exchange Composite Index). This is not the case in music, advanced education, social science and natural science fields, but it should be kept in mind that this test is a conservative one that leaves out non-monetary private benefits and

most of the social benefits associated with these fields. From the point of view of the contribution of investment in higher education to measured economic growth, however, the rate of return criterion for investment would suggest that educational investment should be expanded where the social rate exceeds some estimate of the average social discount rate, such as the 10% return available on the average on financial assets. This criterion would call for expanding investment in health, pharmacy, law, engineering, and business fields, for example. Analogously, some budget or enrollment limits in education and related fields, all with some eye to externalities and to newer forecasts of future trends, would increase the social efficiency of the system.

Second, subsidies to students and institutions apparently do not seriously distort student choices with respect to these occupations since not only the private rates but also the social rates of return, are highest in the same health, law, engineering, technical, and business areas.

Third, at the advanced graduate levels, expected social rates of return to education for white males in medicine and law are among the highest (12-15%) seen in column 4. For medicine, this takes the higher costs of medical education into account through the higher foregone earnings and through most of the full institutional costs over the longer period of years required for an MD. The high rate of return is a more meaningful economic criteria for the existence of a shortage of physicians, assuming that it is used together with information about the number in the training pipeline, than are head counts of doctors per capita. The latter do not reflect the economists' concept of scarcity. The implicit

social rate of return to white males seeking the JD degree also is expected to be high, at 15.5%. But, with further future increases in the demand for medical care expected with national health insurance and with increases in the income and age of the post-World War II population bulge, the returns to society from continued expansion in medical education may be underestimated if attention is given only the number in the pipeline. On the other hand, white males choosing Ph.D. programs primarily oriented to college teaching (e.g., college professors, natural scientists, and social scientists) anticipate significantly lower social rates of return as can be seen in Table 8. With the decline in college enrollments following the 1957-1975 decline in fertility rates, the rates of return in those Ph.D. programs oriented to academic job markets could fall even further.

Finally, it is important to make some comparisons between these new microeconomic occupation rates and those computed by Eckhaus, et. al. (1974) for 1960. The social rates in Table 8 are appropriate to longer range decisions in that they apply to the entire degree program (not just the marginal years), and, in contrast to Eckhaus, use the expected earnings of individual respondents (rather than cross-section means). They also employ a standardized opportunity cost (average earnings for those with the same education and of the same race and sex), rather than a different opportunity cost for each field. Nevertheless, his rates are about the same at the bachelor's level in most fields as the social rates in Table 8.[9] This suggests what could be an important tendency for many of the differences in rates among occupations to persist. For example, from 1960 to 1976, the implicit social rates of

return at the bachelor's level for Accountants remained close to the 16.5 percent estimated by Eckhaus. Among Engineers, the approximate 12 percent rate of return for 1960 is somewhat lower than our 1976 rate. The rate of return for Pharmacists stayed in the 20 percent range over this period as well.

Differences in rates of return among fields at the more advanced levels also persist. The relatively high rates of return we find in 1978 for Doctors and Dentists in Table 8 (12.2%) are very similar to those found by Eckhaus for 1960. Eckhaus reports actual rates of return for College Professors for 1960 of from 0 to 10 percent (depending on the choice of field for computation of opportunity cost) that span the 5.2 percent social rate for 1978 reported in Table 8.

Since differences in rates of return among occupations appear to persist over time in spite of some response in the choices made by students and their families, the differences at each degree level take on even greater significance for educational planning. At the advanced levels, rates tend to be the highest in Table 8 as has been mentioned in the fields where there are outlets other than into teaching, in fields where there are enrollment quotas and other non-market barriers to entry, and in fields where there are professional degrees (e.g., Medicine, Dentistry, Law, Management). At the bachelor's level, social rates are highest in technical fields (24.4%), accounting (17.8%), and health areas (16.1%). The low rates for persons who enter college expecting to become teachers, social and natural scientists, for example, suggest fields where there is oversupply (in the case of elementary, secondary, and college teachers) as well as lower national priorities in the support of social and natural science than prevailed in the 60's.

IV. Conclusions

Overall, it can be concluded that long run rates of return to investment in higher education estimated at the overtaking age 8 years after graduation or by use of later points on the age earnings profile have continued to remain relatively steady at 13-14%, at least up through 1977. The rates of return implicitly expected by students based on their own costs and expected earnings as of 1976 averaged 17%. These rates also were relatively high throughout this period in relation to the 10-12% rate of return available from investment in financial assets.

Rates of return available to investment in higher education exhibit wide variation among occupational fields, with expected social rates in the highest return fields of medicine, pharmacy, engineering, law and business ranging from 13% to 19%, well above average returns on financial assets. At the low end are expected social rates of return from -4% to 7% in advanced training in fields relating to teaching, natural science, social science, and the training of clergymen and musicians. This breakdown of monetary returns by occupational fields fails to incorporate the sometimes substantial non-monetary private returns and social benefit spillovers, but still the monetary returns alone in many fields continue to offer a very competitive return suggesting that here the returns to higher education are clearly worth the cost.

Differences in private rates of return among fields both at the BA and at advanced levels reveal patterns similar to differences in these social rates of return, suggesting that the structure of financial aids does not distort private choices. But comparing our results to those obtained by Eckhaus et. al. for 1960, there is a clear suggestion that

wide differences in rates of return tend to persist, perhaps in part because of internal budget allocations and related enrollment limits, one evidence of inefficiency from a narrow measured economic growth perspective.

There is also a pattern of differences in the rates of return to investment at different types of institutions. These rates are of particular interest because there are significant differences in costs among institutions and private and social decisions depend upon whether or not these cost differences are justified by differences in returns. The earnings expected by the students over their life cycle, which were found to be reasonably realistic in reflecting differences among occupational fields, degree levels, and age, also reflect these sources of differences in earnings among graduates of different institutions, quite apart from differences in institutional quality. The results suggest that although per student total costs are highest at the private and public research universities, the expected returns also tend to be higher there, and social rates of return are also higher there, especially for students seeking advanced degrees. For students at private liberal arts colleges, the higher private costs result in low private rates of return for those planning to terminate with a bachelors degree, especially in relation to the higher private rates of return available at private or public four year comprehensives, which may reflect the less vocationally-oriented BA-level fields at the liberal arts colleges. But for those students planning to seek advanced degrees, much of the private cost disadvantage disappears, and attendance at a liberal arts college is more advantageous than attending a public or private four

year comprehensive institution. Finally, the place where the comprehensive four year colleges have their best competitive advantage is among those students seeking a terminal bachelor's degree. At this level, both the private and the social rates of return are among the highest available.

These results do not suggest that there are not institutions that will continue to face financial distress. As the large wave of college-age young adults produced by the high fertility rates that peaked in 1957 pass on out of the educational institutions, the problems brought on by declining enrollments, throughout the 1980's will be felt at the more recently established and less well endowed institutions. Unusually high inflation rates in 1979 will also continue to adversely affect all institutions. So high fixed costs will be a problem, especially at the less well established institutions, which would not make institutional expansion efficient. But institutional distress does not mean that for the students enrolled, investment in higher education will not continue to be an advantageous investment both from a private and from a social point of view.

These conclusions are predicated on the distinction between a longer run rate of return, which brings later points in the life cycle into view, and a shorter run focus on starting salaries which does not emphasize the assimilation of new entrants into the labor force. However, real starting salaries of college graduates stabilized in the 1975-79 period following their decline in the early 70's, and at about their 1964 levels. Following the serious inflation and recession of 1979-80, there is no reason to think that real salaries will not stabilize again, especially as the large population wave that is passing out of the colleges ends.

As technological advance continues to stimulate the job markets for college graduates, and the large population-recession shock is assimilated, it is also interesting that the relative advantage of college graduates over high school graduates in the older 35-44 age bracket also has not fallen below the level of the 60's and, at least as yet, no clear trend is apparent.

Finally, the conclusions offered here are not sweeping, but are instead specific. Higher education has continued to be well worth the investment cost over time, but on a short term basis this can vary. Efficiency could be increased by some expansion in the dollars budgeted for and hence the numbers admitted to the high return fields, and (at specific degree levels) at the higher return institutions, with some contraction of real budgets and numbers in the other fields and other institutions. This is an application of the lowest level humane growth criterion from Chapter 1, given the controls for ability. Budgeting steps of this nature however also need to take qualitative cognizance of the non-monetary private returns and of the social benefit spillovers, thereby reaching higher in the hierarchy of efficiency criteria, and enhancing the contribution of education to growth.

Appendix A

Computation of the Internal Rate of Return

To compute the pure internal rate of return, Equation (1) below (which is repeated for convenience from the text) was solved for r* by iteration for each rate for each student. r* is defined as the expected rate of return when Y_t in Eq. (1) is the expected real net earnings differential given by Equation (2), and r* is the realized rate of return when Y_t is the realized real net earnings differential defined by Equation (4):

$$(1) \qquad \sum_{t=1}^{G-E} I_t(1 + r^*)^t = \sum_{t=1}^{R-G} Y_t/(1 + r^*)^t$$

For students planning graduate programs, the investment-cost to the student and his family was increased during the graduate school years by replacing high school earnings with the earnings of a college graduate as the measure of foregone earnings costs. To measure monetary returns, the retirement age, R, was used rather than the length of life, L_2, since earnings before retirement include earnings saved and major contributions to pension plans.

Y_t^e, the expected real net earnings differential, was estimated using the following algorithm:

$$(2) \qquad Y_t^e = \alpha(E_1^e - E_1^{HS})(1 + g)^t, \text{ in order to get } Y_t^e \text{ at any year t,}$$

where g, the implicit rate of growth of real earnings was computed from:

$$(3) \qquad E_{25}^e - E_{25}^{HS}(1 + .02)^{25} = (E_1^e - E_1^{HS})(1 + g)^{25}.$$

Here: E_i^e = earnings expected by the student at graduation (i=1) and twenty five years later (i=25) expressed in real terms, and

E_i^{HS} = earnings realized by high school graduates of the same race and sex at age 21 (i=1) and twenty five years later (i=25).

High school earnings are increased by a 2% per annum growth factor to allow for economy-wide growth in productivity in which high school graduates share. College students were assumed to include this productivity growth when asked to estimate the earnings they expect to receive "before taxes, and assuming no inflation, 25 years from now."

Y_t, the realized net earnings differential, was estimated in the same manner:

$$(3) \qquad Y_t = \alpha(E_1 - E_1^{HS})(1 + g),$$

computing g from:

$$(4) \qquad (E_{25} - E_{25}^{HS})(1 + .02)^{25} = (E_1 - E_1^{HS})(1 + g)^{25},$$

where E_i = earnings of college graduates at graduation (i=1) and 25 years hence (i=25) who are of the same race and sex and in the same occupational field being chosen by the student.

The only difference between this and the expected rates in Eq. (2) and (3) is that E_{25} as well as E_{25}^{HS} must be adjusted for expected productivity growth. Note that g in both cases is independent of α and of the tax rate, say T, since both sides in Eqs. (2) and (4) would be multiplied by both α and $(1 - T)$.

α, the percent of the net earnings differential attributable to college is assumed to be .66. This represents a conservative estimate of the contribution of education to earnings, since some have estimated it at closer to 1.0, and hence leads to a more rigorous test of whether the

returns to college are worth the cost. E. Denison (1964, pp. 78-9) originally concluded after examining the evidence that about 66% of the gross earnings differentials between college and high school graduates can be attributed to education alone after controlling for I.Q. scores, rank in the high school class, and father's occupation, a result that has been confirmed by Becker (1975, pp. 158-166), Weisbrod and Karpoff (1968). It is also close to the 55% percent of variation in earnings explained on the average by schooling and schooling-related factors by J. Mincer (1964, p. 92, Eq. 2) although Layard and Psacharopoulos (1974) suggest that $\alpha = .90$ is more plausible.

Appendix B

DISTRIBUTION OF RESPONDENTS IN EACH WAVE AND

IN THE CENSUS OF ALL STUDENTS

	1977 Graduates Before Weights	Census of all Students[1]	1977 Graduates Weighted[2]	1976 Graduates Before Weights	Census of all Students[1]	1976 Graduates Sample Weighted[2]
Public Institutions	73.8	75.5	75.5	80.0%	75.5	75.5
Universities	28.0	21.8	21.8	37.0	21.8	21.7
Male	11.9	10.0	10.0	15.0	10.0	9.8
Female	16.1	11.8	11.8	22.0	11.8	11.9
Four Year	29.0	30.7	30.7	29.1	30.7	29.9
Male	12.5	20.3	20.3	9.9	20.3	19.8
Female	16.5	10.4	10.4	19.2	10.4	10.1
Two Year	16.9	23.0	23.0	14.0	23.0	23.9
Male	7.3	13.0	13.0	5.6	13.0	12.7
Female	9.6	10.0	10.0	8.4	10.0	11.2
Private Institutions	26.1	24.6	24.3	20.0	24.6	24.6
Universities	5.0	5.5	5.5	2.3	5.5	5.3
Male	2.2	2.8	2.8	.6	2.8	2.7
Female	2.8	2.7	2.7	1.7	2.7	2.6
Four Year	17.6	17.1	17.1	16.3	17.1	17.6
Male	7.8	8.8	8.8	5.5	8.8	9.5
Female	9.8	8.3	8.3	10.8	8.3	8.1
Two Year	3.5	1.7	1.7	1.3	1.7	1.7
Male	1.8	.7	.7	.5	.7	.7
Female	1.7	1.0	1.0	.8	1.0	1.0
All Institutions[3]	99.9	100.1	99.8	100.0	100.1	101.0

1. Source: U. S. Office of Education
2. Weights simultaneously correct for type of institution, sex, and percent receiving financial aid, although the latter dimension is not shown separately.
3. Totals vary from 100% only because of rounding.

References

American College Testing Program. College Student Profiles. Iowa City, Iowa: ACT, 1966.

Augenblick, John and Hyde, W. Patterns of Funding, Net Price and Financial Need for Postsecondary Students. Report No. F79-1. Denver: Education Commission of the States, March, 1979.

Becker, Gary S. Human Capital, Second Edition, New York and London: Columbia University Press, 1975.

Carnoy, Martin and Marenbach, D. "The Return to Schooling in the United States, 1939-1969." Journal of Human Resources 10 (Summer 1975): 312-31.

Cohn, Elchanan. The Economics of Education, Revised Edition. Cambridge: Ballinger Publishing Co., 1978.

College Placement Council. "A Study of 1978-79 Beginning Offers." Final Report. Bethlehem, Pa.: Author, July 1979 (and earlier issues).

Dresch, Stephen P. and Waldenberg, A. "High School Performance and College Aspirations/Attendance," unpublished manuscript. New Haven: Institute for Demographic and Economic Studies, April 1978.

Denison, E. F. "Proportion of Income Differentials Among Education Groups Due to Additional Education," in J. Vaizey, Ed., The Residual Factor and Economic Growth. Paris: OECD, 1964.

Eckhaus, Richard S., El Safty, A., and Norman, V. "An Appraisal of the Calculation of Rates of Return to Higher Education," in Margaret S. Gordon, ed., Higher Education and the Labor Market. New York: McGraw-Hill Book Company, 1974, 333-371.

Farrel, Maurice L., Ed. The Dow Jones Investor's Handbook. Princeton, New Jersey: Dow Jones Books, 1978.

Ferber, M. and McMahon, W. W., "Womens' Expected Earnings and Their Investment in Higher Education." The Journal of Human Resources, (14) (Summer 1979): 405-20.

Freeman, Richard. "Overinvestment in College Training?" Journal of Human Resources 10 (Summer 1975): 287-311.

_____. The Overeducated American. New York: Academic Press, 1976.

_____. "The Decline in the Rewards to College Education." The Review of Economics and Statistics, forthcoming 1979.

Layard, Richard and Psacharopoulos, G. "The Screening Hypothesis and Returns to Education." Jour. Pol. Economy 82, No. 5, Sept./Oct. 1974, 985-98.

Liberman, Joseph. "The Rate of Return to Schooling: 1958-1976." Faculty Working Paper, Chicago: Department of Finance at University of Illinois, Chicago Circle. Forthcoming, 1979.

Lillard, Lee. "Rates of Return to Higher Education." American Economic Review, September 1979.

McMahon, Walter W. and Wagner, Alan P. "A Study of the College Investment Decision." ACT Research Reports, No. 59. Iowa City: American College Testing Program, July 1973.

_____. "Expected Returns to Investment in Higher Education." Journal of Human Resources, forthcoming 1979.

Mincer, Jacob. Schooling, Experience, and Earnings. New York: National Bureau of Economic Research, 1974.

Psacharopoulos, George. Returns to Education. San Francisco: Jossey-Bass, 1973.

Ribich, Thomas I. and Murphy, J. "The Economic Returns to Increased Educational Spending." Journal of Human Resources 10, Winter 1975: 56-77.

Smith, James P. and Welch, Finis. The Overeducated American? A Review Article. Rand Paper P-6253. Santa Monica: The Rand Corporation, November 1978.

_____. "Black-White Wage Ratios: 1960-1970." American Economic Review, June 1977.

Wagner, Alan P. "Determinants of Parental Contributions Toward Post-secondary Education Expenses: The Effects of Student Aid Subsidies," unpublished manuscript. Purdue University, West Lafayette, August 1978.

Wagner, Alan P. and Lois D. Rice. Student Financial Aid: Institutional Packaging and Family Expenditure Patterns, Final Report. National Center for Education Statistics, Department of Health, Education and Welfare, Washington, D.C., August 1977.

Wagner, Alan P. and Laurence J. Tenison. "Data Check Summary Report for the Study of Student Financial Aid," Working Paper No. 1. Washington, D.C.: College Entrance Examination Board, February 1976.

Weisbrod, B. A. and Karpoff, P. "Monetary Returns to College Education, Student Ability, and College Quality." Rev. Econ. Stat., Nov. 1968.

Footnotes

*The authors are indebted to Nguyen Hoang and to Len Nichols who helped with the computations, and to Joseph Liebman for permission to use excerpts from his forthcoming article on rates of return over time.

1. Returns also include increments to earnings attributable to learning on the job by college graduates, part of which is made possible by the prior schooling. But it is assumed for the purposes of this paper that formal schooling ends upon graduation, and that the investment-costs of learning on the job are captured by the lower beginning and steeper slope of the after-college age earnings profile.

2. Ibid, p. 15. Emphasis added.

3. Ibid, p. 22.

4. The ACT test, taken by entering freshmen, gives a composite score covering reasoning ability in each of the four areas of English, math, social science, and natural science. See American College Testing Program (1966).

5. The Carnegie Commission's classification attempts to distinguish among institutions of higher education according to the size of graduate and research programs, faculty quality (i.e., percent Ph.D.'s on the staff), student quality, institution size, and the range of academic fields of study available to undergraduates. Among four-year institutions, for example, research universities rank high on all measures while liberal arts colleges score low on several.

6. Although the alternate figures are essentially intended to measure the same thing, the differences may be attributable to Bowen's "student unit" (weighting for graduate, upper division, and lower division enrollments) in place of our FTE weighting and the Bowen's median versus our mean measure of "average."

7. Available grant aid has increased by a factor of ten over the 1970's (see Wagner, 1978), and information from a wide variety of sources indicates that the most important influences on the amount of grant-aid a student receives are a negative relation to family income, and a positive relation to costs of attendance (tuition, books, room and board). (Wagner and Rice, 1977; Dresch, 1978). In 1977-78, the grant at a private four-year institution was more than double the gift aid received by a peer at a four-year public institution (Augenblick and Hyde, 1979).

8. In 1973-74, about one-third of the baccalaureate degrees conferred by private liberal arts colleges were from humanities, social sciences, and other "liberal arts" fields, compared to a one-fifth

share of baccalaureates granted by all four-year institutions together. Alternatively, over one-fourth of the BA's in 1973-74 were in professional-technial fields (engineering, architecture, business, etc.). Less than 10 percent of liberal arts college graduates received degrees in these fields.

9. Eckhaus calculates internal rates of return under the assumption that direct costs are cancelled out by part-time earnings. If the conventional assumption holds (as well it might for 1960 when direct costs of tuition and books were low and financial aid funds were limited), then his "unadjusted" rates come closest to our social rates of return.

Faculty Working Papers

THE DEVELOPMENT OF A DISTRICT OFFICE PERFORMANCE MODEL FOR THE SOCIAL SECURITY ADMINISTRATION

John S. Chandler, Assistant Professor, Department of Accountancy

#620

College of Commerce and Business Administration
University of Illinois at Urbana-Champaign